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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/081,312	02/21/2002	Won Bang	2929D1/TCG/PMD/LE	6198
32588	7590	02/10/2004	EXAMINER	
APPLIED MATERIALS, INC. 2881 SCOTT BLVD. M/S 2061 SANTA CLARA, CA 95050			MARKHAM, WESLEY D.	
			ART UNIT	PAPER NUMBER
			1762	

DATE MAILED: 02/10/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/081,312	BANG ET AL.	
	Examiner	Art Unit	
	Wesley D Markham	1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 February 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>1 total</u> . | 6) <input type="checkbox"/> Other: . |

DETAILED ACTION

1. The examiner notes that the claims of the instant application presented by the applicant begin with number 13 and end with number 21 (i.e., no Claims 1 – 12 were presented). Pursuant to 37 CFR 1.126, Claims 13 – 21 have been re-numbered as Claims 1 – 9, respectively. **Claims 1 – 9** are currently pending in U.S. Application Serial No. 10/081,312, which is a divisional application of U.S. Application Serial No. 09/428,140 (filed on 10/26/1999), which claims priority to U.S. Provisional Application No. 60/106,530, (filed on 10/31/1998), and an Office Action on the merits follows.

Information Disclosure Statement

2. The IDS filed by the applicant on 4/22/2002 is acknowledged, and the references listed thereon have been considered by the examiner as indicated on the attached copy of the PTO-1449 form.

Drawings

3. The formal drawings (2 sheets, 5 total figures) filed by the applicant on 2/21/2002 are acknowledged and approved by the examiner.

Specification

4. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed. The following title is suggested: "Method of Forming a Corrosion Resistant Coating"
5. The disclosure is objected to because of the following informalities:
 - Page 5, paragraph [0018], line 7: The chemical formula "AlN" appears to be misspelled "A1N".
 - Page 7, paragraph [0025], lines 1 – 4: The phrase, "the coating 150 is deposited at the temperatures described above and at a chamber pressure of at least 1×10^{-5} torr – i.e., preferably a reduced pressure environment of lower than 1×10^{-5} torr" is contradictory and confusing. Specifically, the aforementioned phrase appears to state that the coating is deposited both at a chamber pressure of at least 1×10^{-5} torr and lower than 1×10^{-5} torr, which are mutually exclusive process conditions. This contradiction renders the phrase confusing.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).
8. Claims 1 – 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Toyoda et al. (JP 09-328382 A) in view of Ohashi et al. (USPN 6,139,983), and in further view of Itoh et al. (USPN 6,287,683 B1), Tomita et al. (USPN 4,637,684), and Morton (USPN 6,162,495).
9. Regarding independent **Claim 1**, Toyoda et al. teaches a method of forming a coated part, specifically an aluminum nitride base material used as a susceptor in semiconductor fabrication processes such as CVD and dry etching (paragraphs [0001], [0007], and [0008]), the method comprising the step of coating the aluminum nitride base material with a magnesium fluoride coating "14" by a vacuum deposition method or a sputtering method (Figure 1, paragraphs [0006] – [0008], [0011] – [0012], and [0014]). This magnesium fluoride coating functions to protect the aluminum nitride component from corrosive fluorine-containing gases present during CVD or etching operations (i.e., the coating reduces corrosion of the component

upon exposure to a corrosive environment) (paragraphs [0004], [0005], and [0008]). Toyoda et al. does not explicitly teach that the magnesium fluoride coating has a density of at least about 85% and a purity of at least about 99%. Specifically, Toyoda et al. is silent regarding the density and purity of the magnesium fluoride coating, as well as the specific process conditions (e.g., temperature and pressure) used to deposit the coating. However, Toyoda et al. does teach that the magnesium fluoride target used in the deposition process has a purity of 99.5% (paragraph [0014]). This teaching would at least suggest to one of ordinary skill in the art that Toyoda et al. is concerned with and desires depositing a coating having a high purity. Ohashi et al. teaches an analogous process of coating a wafer-supporting member with a magnesium fluoride layer in order to protect the member from corrosion by halogen-containing gases (Abstract, Col.1, lines 53 – 67, Col.2, lines 1 – 8, and Col.3, lines 31 – 61). Ohashi et al. teaches that the method of producing the fluoride layer should be such that defects and pin-holes are not formed in the film (Col.6, lines 15 – 27). Therefore, it would have been obvious to one of ordinary skill in the art to desire to deposit / form the magnesium fluoride coating of Toyoda et al. in such a manner that the coating is free of defects and pin-holes (as taught to be desirable by Ohashi et al.) so that the coating provides the aluminum nitride component with optimum corrosion resistance. As a denser, more highly packed coating would be expected to have fewer defects (e.g., voids, holes) and pin-holes than a porous, less dense coating, it would also have been obvious to one of ordinary skill in the art to desire to deposit / form the magnesium fluoride coating of Toyoda et al. in such a

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manner that the coating is sufficiently dense to minimize or eliminate defects, such as voids, and pin-holes in the coating. Itoh et al. teaches that, in the art of depositing a magnesium fluoride film by vacuum deposition, EB deposition, sputtering, etc., the packing rate / density of the film can be adjusted by controlling the degree of vacuum (i.e., the pressure) and the film-forming temperature during the process (Col.4, lines 64 – 67, Col.5, lines 1 – 24). In other words, Itoh et al. teaches that the temperature and pressure in a magnesium fluoride deposition process are result / effective variables that are used to control the density of the deposited film. The lower the degree of vacuum (i.e., the higher the pressure) and the lower the film-forming temperature, the lower the density of the deposited film (Col.5, lines 10 – 14). Consequently, the lower the pressure and the higher the temperature, the higher the density of the deposited film. Tomita et al. teaches that a magnesium fluoride film of low porosity (i.e., high density) can be deposited on a substrate by heating the substrate to the order of 300° C during deposition (Col.4, lines 39 – 54). Additionally, Morton teaches that, by using a low pressure of 10^{-6} torr or less during a magnesium fluoride deposition process, a pure, dense magnesium fluoride film can be formed (e.g., without contaminants such as oxygen or hydrogen) (Col.3, lines 48 – 66). As such, it would have been obvious to one of ordinary skill in the art to optimize as result / effective variables the temperature and pressure of the magnesium fluoride deposition process of Toyoda et al. through routine experimentation in order to obtain an optimized magnesium fluoride coating that has both a high purity and density (i.e., free of defects and pin-holes), as desired by the

combination of Toyoda et al. and Ohashi et al. In doing so, one of ordinary skill in the art would have optimized the temperature to be, for example, on the order of 300° C (as taught by Tomita et al.) and the pressure to be, for example, 10^{-6} torr or less (as taught by Morton) during the magnesium fluoride deposition process because Tomita et al. and Morton et al. teach that these temperatures and pressures are suitable for depositing a dense, pure magnesium fluoride film, as desired by the combination of Toyoda et al. and Ohashi et al. The deposition of a magnesium fluoride coating at these process conditions would have inherently produced a magnesium fluoride coating having a density of at least about 85% and a purity of at least about 99%, as required by Claim 1, because the aforementioned magnesium fluoride deposition process conditions are identical to the applicant's disclosed magnesium fluoride deposition process conditions that achieve the claimed coating density and purity (see, for example, paragraphs [0021], [0023], and [0025] of the applicant's specification). Regarding **Claims 2 and 3**, the combination of Toyoda et al., Ohashi et al., Itoh et al., Tomita et al., and Morton does not explicitly teach that the magnesium fluoride coating has a density of between about 85 – 90% (Claim 2) or about 100% (Claim 3). However, as fully set forth above in the discussion of Claim 1, it would have been obvious to one of ordinary skill in the art to optimize as result / effective variables the temperature and pressure of the magnesium fluoride deposition process of Toyoda et al. through routine experimentation in order to obtain an optimized magnesium fluoride coating that has both a high purity and density (i.e., free of defects and pin-holes), as desired by the combination of Toyoda

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et al. and Ohashi et al. The exact density (e.g., between about 85 – 90%, or about 100%) would have been determined and optimized by one of ordinary skill in the art based upon the specific temperature and pressure used in the deposition process. Regarding **Claim 4**, Toyoda et al. also teaches that the corrosive environment comprises fluorine (paragraphs [0005] and [0008]). Regarding **Claims 5 and 6**, the combination of Toyoda et al., Ohashi et al., Itoh et al., Tomita et al., and Morton also teaches that the coating step is performed at a pressure of not more than about 1×10^{-5} torr (Claim 5) and at a temperature of at least 250° C (Claim 6) (see the discussion of Claim 1 above). Regarding **Claim 7**, Toyoda et al. also teaches that the component part comprises aluminum nitride or aluminum (paragraphs [0001] and [0014]).

10. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Toyoda et al. (JP 09-328382 A) in view of Ohashi et al. (USPN 6,139,983), in further view of Itoh et al. (USPN 6,287,683 B1), Tomita et al. (USPN 4,637,684), and Morton (USPN 6,162,495), and in further view of Kubota et al. (USPN 5,643,483).
11. The combination of Toyoda et al., Ohashi et al., Itoh et al., Tomita et al., and Morton teaches all the limitations of **Claim 8** as set forth above in paragraph 9, except for a method wherein the component part (i.e., the susceptor / wafer holder of Toyoda et al.) has a surface finish of less than about 10RA (i.e., a roughness of 10 microinches, or 0.254 μm). Specifically, the aforementioned combination of references is silent regarding the surface finish (i.e., roughness) of the susceptor to

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be coated. However, Kubota et al. teaches that, in the art of semiconductor processing, the surface roughness of a susceptor surface is preferably as smooth as possible because a smooth surface provides better heat transfer to a workpiece mounted thereon and less contamination by the deposition of foreign materials (Col.1, lines 7 – 15, Col.3, lines 9 – 14, and Col.4, lines 5 – 13). A preferred surface roughness taught by Kubota et al. is 0.01 μm to 0.1 μm (i.e., less than 10 microinches). Therefore, it would have been obvious to one of ordinary skill in the art to perform the process of the combination of Toyoda et al., Ohashi et al., Itoh et al., Tomita et al., and Morton on a susceptor having as smooth a surface as possible, including a surface finish of less than about 10RA, with the reasonable expectation of successfully and advantageously obtaining a susceptor that is corrosion resistant, provides good heat transfer to a substrate mounted thereon, and is not easily contaminated by the deposition of foreign materials.

12. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Toyoda et al. (JP 09-328382 A) in view of Ohashi et al. (USPN 6,139,983), in further view of Itoh et al. (USPN 6,287,683 B1), Tomita et al. (USPN 4,637,684), and Morton (USPN 6,162,495), and in further view of Ohmi et al. (USPN 6,215,806 B1).
13. The combination of Toyoda et al., Ohashi et al., Itoh et al., Tomita et al., and Morton teaches all the limitations of **Claim 9** as set forth above in paragraph 9, except for a method further comprising the step of annealing the magnesium fluoride coating at a temperature of at least about 600° C. Specifically, the aforementioned combination

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of references is silent regarding any further annealing step. However, as set forth above in paragraph 9, it would have been obvious to one of ordinary skill in the art to desire to deposit / form the magnesium fluoride coating of Toyoda et al. in such a manner that the coating is sufficiently dense to minimize or eliminate defects, such as voids, and pin-holes in the coating (i.e., to form a coating having a high density). Ohmi et al. teaches that metal fluoride films can be densified by annealing the films at a temperature of, for example, 600° C, after forming the films (Col.11, lines 51 – 61, Col.13, lines 22 – 28). This temperature is within the applicant's claimed range of "at least about 600° C". It would have been obvious to one of ordinary skill in the art to anneal the magnesium fluoride coating of the combination of Toyoda et al., Ohashi et al., Itoh et al., Tomita et al., and Morton at a temperature of, for example, 600° C with the reasonable expectation of successfully and advantageously increasing the density of the film, thereby insuring that the coating is free from defects (e.g., voids) and pin-holes and provides optimum corrosion resistance.

14. Claims 1 and 3 – 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Tomita et al. (USPN 4,637,684) in view of Morton (USPN 6,162,495).

15. Regarding independent **Claim 1**, Tomita et al. teaches a method of forming a coated

part, specifically a coated prism of a waveguide, the method comprising coating the prism with magnesium fluoride by evaporation (Abstract, Col.4, lines 4 – 7 and 36 – 54). Tomita et al. teaches that the coating process is performed by heating the substrate to the order of 300° C during the evaporation in order to form a film of low

porosity (i.e., high density) and prevent any fluctuation of the refractive index of the film (Col.4, lines 49 – 54). Tomita et al. does not explicitly teach that the magnesium fluoride film has a density of at least about 85% and a purity of at least about 99%. Specifically, Tomita et al. is silent regarding the exact density and purity of the magnesium fluoride coating, as well as the specific pressure used during the deposition process. Morton teaches that, by using a low pressure of 10^{-6} torr or less during a magnesium fluoride deposition process, a pure, dense magnesium fluoride film can be formed (e.g., without contaminants such as oxygen or hydrogen) (Col.3, lines 48 – 66). Therefore, it would have been obvious to one of ordinary skill in the art to deposit the magnesium fluoride film of Tomita et al. at a pressure of 10^{-6} torr or less with the reasonable expectation of successfully and advantageously using a deposition process pressure that leads to a pure, dense magnesium fluoride film, as desired by Tomita et al. The deposition of a magnesium fluoride film at these process conditions would have inherently produced a magnesium fluoride coating having a density of at least about 85% and a purity of at least about 99%, as required by Claim 1, because the aforementioned magnesium fluoride deposition process conditions are identical to the applicant's disclosed magnesium fluoride deposition process conditions that achieve the claimed coating density and purity (see, for example, paragraphs [0021], [0023], and [0025] of the applicant's specification). The combination of Tomita et al. and Morton does not explicitly teach that the coating "reduces corrosion of said component part upon exposure to a corrosive environment". However, as the magnesium fluoride film of the combination

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of Tomita et al. and Morton is deposited on a "component part" and is both pure and dense (see the discussion above), the film would inherently reduce the corrosion of the component part (i.e., the prism / waveguide) upon exposure to a corrosive environment. Regarding **Claim 3**, the combination of Tomita et al. and Morton does not explicitly teach that the magnesium fluoride coating has a density of about 100%. However, such a density would have inherently been achieved by using the process conditions (i.e., temperature and pressure) taught by the combination of Tomita et al. and Morton (see, for example, paragraph [0021] of the applicant's specification).

Regarding **Claim 4**, the combination of Tomita et al. and Morton does not explicitly teach that the corrosive environment comprises fluorine. However, as the magnesium fluoride film of the combination of Tomita et al. and Morton is deposited on a "component part" and is both pure and dense (see the discussion above), the film would inherently reduce the corrosion of the component part (i.e., the prism / waveguide) upon exposure to a corrosive environment of any sort, including a corrosive environment comprising fluorine. Please note that the applicant's claims do not require actually exposing the component part to a corrosive environment.

Regarding **Claims 5 and 6**, the combination of Tomita et al. and Morton also teaches that the coating step is performed at a pressure of not more than about 1×10^{-5} torr (Claim 5) and at a temperature of at least 250° C (Claim 6) (see the discussion of Claim 1 above).

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16. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tomita et al.

(USPN 4,637,684) in view of Morton (USPN 6,162,495), in further view of Itoh et al.

(USPN 6,287,683 B1).

17. The combination of Tomita et al. and Morton teaches all the limitations of **Claim 2** as

set forth above in paragraph 15, except for a method wherein the magnesium

fluoride coating has a density of between about 85 – 90%. However, Tomita et al.

does desire to deposit a magnesium fluoride film having a low porosity in general

(Col.4, lines 49 – 54). Itoh et al. teaches that, in the art of depositing a magnesium

fluoride film by vacuum deposition, EB deposition, sputtering, etc., the packing rate /

density of the film can be adjusted by controlling the degree of vacuum (i.e., the

pressure) and the film-forming temperature during the process (Col.4, lines 64 – 67,

Col.5, lines 1 – 24). In other words, Itoh et al. teaches that the temperature and

pressure in a magnesium fluoride deposition process are result / effective variables

that are used to control the density of the deposited film. The lower the degree of

vacuum (i.e., the higher the pressure) and the lower the film-forming temperature,

the lower the density of the deposited film (Col.5, lines 10 – 14). Consequently, the

lower the pressure and the higher the temperature, the higher the density of the

deposited film. It would have been obvious to one of ordinary skill in the art to

optimize as result / effective variables the temperature and pressure of the

magnesium fluoride deposition process of the combination of Tomita et al. and

Morton (and therefore to optimize the film density) through routine experimentation

in order to obtain a magnesium fluoride film that has a "low porosity" (i.e., a high

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density), as desired by Tomita et al. The exact density of the film would have been determined by a purveyor in the art, depending on the degree of "low porosity" desired.

18. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tomita et al.

(USPN 4,637,684) in view of Morton (USPN 6,162,495), in further view of Itoh et al.

(USPN 6,287,683 B1), and in further view of Ohmi et al. (USPN 6,215,806 B1).

19. The combination of Tomita et al., Morton, and Itoh et al. teaches all the limitations of

Claim 9 as set forth above in paragraph 17, except for a method further comprising the step of annealing the magnesium fluoride coating at a temperature of at least about 600° C. Specifically, the aforementioned combination of references is silent regarding any further annealing step. However, Tomita et al. does desire to obtain a magnesium fluoride film having a low porosity in general (Col.4, lines 49 – 54). Ohmi et al. teaches that metal fluoride films can be densified by annealing the films at a temperature of, for example, 600° C, after forming the films (Col.11, lines 51 – 61, Col.13, lines 22 – 28). This temperature is within the applicant's claimed range of "at least about 600° C". It would have been obvious to one of ordinary skill in the art to anneal the magnesium fluoride film of the combination of Tomita et al., Morton, and Itoh et al. at a temperature of, for example, 600° C with the reasonable expectation of successfully and advantageously increasing the density of the film, thereby reducing the porosity of the film and preventing any refractive index fluctuation of the film, as desired by Tomita et al.

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Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Dornfest et al. (USPN 5,680,013) teaches protecting heated metal surfaces in a plasma-processing chamber by covering the surfaces with a non-bonding ceramic cover material such as MgF_2 .

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wesley D Markham whose telephone number is (571) 272-1422. The examiner can normally be reached on Monday - Friday, 8:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on (571) 272-1415. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.


WDM

Wesley D Markham
Examiner
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